



Particulate Matter



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The following information will help you to become familiar with particulate matter and how it relates to your health.

What is particulate matter?

Particulate matter (PM) is the term for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets. Particles can be suspended in the air for long periods of time. Some particles are large or dark enough to be seen as soot or smoke. Others are so small that they can be detected individually only with specialized microscopes.

Where does PM come from?

Some particles are directly emitted into the air from a variety of sources, such as vehicles, factories, construction sites, farming, unpaved roads, burning wood, and blowing sand and dust in desert environments. Other particles may be formed in the air when gases from burning fuels chemically react with sunlight and water vapor. These can result from fuel combustion in motor vehicles, at oil fields and refineries, at power plants, and in other industrial processes.

How does PM enter the body?

Particulate matter enters the body when you breathe. Large particles can be trapped in your nose and throat and are removed when you cough or sneeze. Small particulate matter that is less than 10-micrometers in diameter can be breathed in (inhaled) into your respiratory tract. A 10-micrometer particle is roughly one-sixth the width of a human hair. This is called the PM₁₀ size range.

In some areas, particulate matter can be very heavy because of high levels of industrial activity or natural environmental conditions (e.g., dry, dusty climates). In these types of environments, larger amounts of PM can be inhaled.

What can I do to reduce my exposure to PM?

When possible, stay inside buildings/tents during particularly windy times. Wearing standard personal protective items, including goggles and cravats (large kerchief-type cloths), can also provide limited relief against windblown sand in a desert environment.

Are there any potential health effects from exposure to PM?

Dust is an irritant that bothers some people more than others. Symptoms such as coughing, sneezing, sinus congestion, sinus drainage (“drip”), and sore throat are common during peak periods. People with asthma or

allergies may feel worse or need more medicine than usual. These effects usually go away quickly after the local weather improves, and permanent health effects are uncommon.

Studies of possible long-term health effects of PM in the atmosphere have been conducted by many organizations, including the American Cancer Society, Harvard University, and the Health Effects Institute (a nonprofit organization jointly funded by the U.S. Environmental Protection Agency [EPA] and industry). In general, these studies suggest that PM does affect long-term lung function, especially in the young and elderly, although this generally occurs only after very long periods (years) of exposure. In addition, research indicates that potential health effects may be related to the type of particles, as well as to the concentration. For instance, particulates generated from combustion and industry have a different chemical nature than sand. However, because current PM studies are inconclusive or inconsistent in their findings, the U.S. EPA is continuing to try to resolve this issue.

Because elevated levels of PM are so common in Southwest Asia, the Office of the Special Assistant for Gulf War Illnesses conducted a study on the health effects of PM. This study examined the potential for adverse health effects from long-term exposure to silica and soot (the main components of PM in Southwest Asia). The study found that, at high concentrations in an occupational environment, and under conditions of extended exposure, high levels of inhaled PM can lead to changes in lung function, damage to lung tissue, and altered respiratory defense mechanisms (e.g., an impaired ability to naturally eject or cough up foreign matter via exhalation). However, limiting outdoor activity during periods of high PM will help reduce exposure that might lead to these conditions.

What do we know about PM in the air in Southwest Asia?

Southwest Asia is known to have some of the highest documented average levels of PM₁₀ in the world. Results of sampling in Kuwait and Saudi Arabia conducted immediately after the Gulf War indicated that PM levels in the air were often above the levels considered safe for the protection of human health by the U.S. EPA. These concentrations were normal for Kuwait and Saudi Arabia before the war. The average level of PM₁₀ in Kuwait and

Saudi Arabia during a seven-month period in 1991 was about 3 to 6 times greater than the annual U.S. standard. However, many areas of the United States also exceed the standard on a regular basis. When PM conditions are at their highest in Southwest Asia (high summer winds plus lots of industrial activity), limiting outdoor activity when possible will help reduce exposure.

The PM samples in Southwest Asia contained roughly 75% of their airborne particulate matter as clays, primarily calcium and silica, which come from the sand typical in this part of the world. Another 10% to 23% of the particulates were carbon (soot) that came from a combination of sources, including the oil fires and various industrial sources, and less than 10% came from miscellaneous sources.

Where can I get more information?

- **Environmental exposure report: Particulate matter**
DoD Special Assistant for Gulf War Illnesses
http://www.gulflink.osd.mil/particulate_final/
- **PM—How Particulate Matter Affects the Way We Live and Breathe**
U.S. Environmental Protection Agency
<http://www.epa.gov/oar/aqtrnd95/pm10.html>
<http://www.epa.gov/air/urbanair/pm/index.html>
- **U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM)**
Phone: 800-222-9698
Internet URL: <http://chppm-www.apgea.army.mil>
Environmental sampling and risk assessment: Mr. Jeff Kirkpatrick, 410-436-8155
General medical information: Dr. Coleen Weese, 410-436-2578
- **Air Force Institute for Environment, Safety and Occupational Health Risk Analysis (AFIERA)**
Phone: 888-232-3764
Internet URL: <http://www.brooks.af.mil/afiera/>
General medical information: Lt Col (Dr.) Kenneth L. Cox, 210-536-1788
- **Navy Environmental Health Center (NEHC)**
Phone: 757-953-0764
Internet URL: <http://www-nehc.med.navy.mil>
General medical information: CDR (Dr.) Alan Philippi
- **Deployment Health Clinical Center (DHCC)**
Phone: 866-559-1627
Internet URL: <http://www.pdhealth.mil/>
Post-deployment health care information: LTC (Dr.) Charles Engel
- **Department of Veterans Affairs**
Internet URL: www.va.gov/enviroagents/